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MORPHOMETRY

OF THE MUSKOKA–HALIBURTON

STUDY LAKES

A. Nicolls, R. Reid and **R**. Girard

DATA REPORT DR 83/3

DATA REPORT SERIES

The data presented in this report were collected by staff of
the Water Resources Branch of the Ontario Ministry of the
Environment as part of the Lakeshore Capacity Study or the Acid
Precipitation in Ontario Study. This unreviewed report does not
necessarily reflect the views or opinions of the Ontario Ministry of
the Environment.

MORPHOMETRY OF THE MUSKOKA-HALIBURTON STUDY LAKES

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PREFACE

The unpublished Data Report Series is intended as a readily available source of basic data collected for lakes and watersheds in the Muskoka—Haliburton area of Ontario. These data were collected as part of the Lakeshore Capacity Study and/or the Acid Precipitation in Ontario Study.

The limnological portion of the Lakeshore Capacity Study (1975-81) was initiated to investigate the relationships between lakeshore development and lake trophic status in low ionic strength Precambrian lakes. The Acid Precipitation in Ontario Study (1979-present) was initiated, in part, to investigate the effects of the deposition of strong acids on aquatic and terrestrial ecosystems in Ontario. The primary findings of these studies have been and will continue to be published as reviewed papers and technical reports.

ABSTRACT

Morphometric maps and tables are presented for the lakes studied as part of the Lakeshore Capacity Study.

Nicolls, A., R. Reid and R. Girard. 1983. Morphometry of the Muskoka-Haliburton Study Lakes. Ont. Min. Envir. Data Report DR 83/3.

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Introduction

This report summarizes the morphometric information collected
for the study lakes of the trophic status component of the Lakeshore
Capacity Study. The methodology used to prepare the maps and
calculate morphometric parameters is outlined by Scheider et al.
(1983). The lake outlines were taken from aerial photographs; more
accurate ground surveys will be carried out in 1983-84 and may
result in slight changes in lake areas and volumes.

The morphometric parameters calculated for each lake are defined
by Hutchinson (1957) and include the following:

1) Area (A) — Lake surface area.
2) Volume (V) — Total lake volume calculated
by summing the individual
stratum volumes determined as
noted below.
3) Mean Depth ($\bar{z}$) — Calculated as V/A.
4) Maximum Depth (z_m)
5) Shoreline Length(L) — Total shoreline length.
6) Development of Shoreline (D_L) — The ratio (dimensionless) of
the shoreline length to the
length of the circumference
of a circle of equal area to
that of the lake:

$$D_L = L/2 \, (\pi A)^{\frac{1}{2}}$$

D_L must be >1 and is a measure of the irregularity of the
shoreline.
7) Development of Volume (D_V) — The ratio of the volume of the
lake to that of a cone of
basal area A and height z_m:

$$D_V = 3\bar{z}/z_m$$

This quantity is an expression of the form of the lake basin.

8) Contour Area (A_i) – The surface area within each of
the depth contours. These
contour areas are used to
calculate strata volumes.

9) Stratum Volume   – The volume of a lake stratum
between two contour depths:

$$V_{m-n} = 1/3 \ (A_m + A_n + (A_m A_n)^{\frac{1}{2}}) \ (m-n)$$

where m = the lower contour depth, and
      n = the upper contour depth.

A morphometric map and a table of morphometric information follow
for each lake. Since Red Chalk Lake can be divided into two distinct
basins, the morphometry for each basin has also been provided.

References

Hutchinson, G.E. 1957. A Treatise on Limnology. John Wiley and
     Sons, Inc., 1015 p.

Scheider, W.A., R.A. Reid, B. Locke and L.D. Scott. 1983. Studies
     of lakes and watersheds in Muskoka-Haliburton, Ontario:
     Methodology. Ont. Min. Envir. Data Report 83/1.

Inflow 1

BLUE CHALK LAKE

MUSKOKA   Dist.
RIDOUT   Tp.
Lat. 45° 12′   Long. 78° 56′

2
4
6
8

8
6
4
2

2   4
6
8

10
12
14
16

Outflow

16

8
6
4
2

16 14

18
20
22

N

0m   100m   500m

Table 1:   BLUE CHALK LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
49.4	42.1	8.5	23	4.60	1.85	1.11

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	49.4	
		8.89
2	39.7	
		7.38
4	34.2	
		6.35
6	29.4	
		5.24
8	23.1	
		3.95
10	16.6	
		3.10
12	14.5	
		2.63
14	11.9	
		2.15
16	9.64	
		1.41
18	4.73	
		0.741
20	2.76	
		0.275
22	0.359	
		0.012
23	0	

Inflow 1

CHUB LAKE
MUSKOKA   Dist.
RIDOUT   Tp.
Lat. 45° 13'   Long. 78° 59'

2

6

4

Inflow 3

N

Outflow

Inflow 2

26

24

22
20
18
16
14

12

10

8

6

4

2

0m   100m   500m
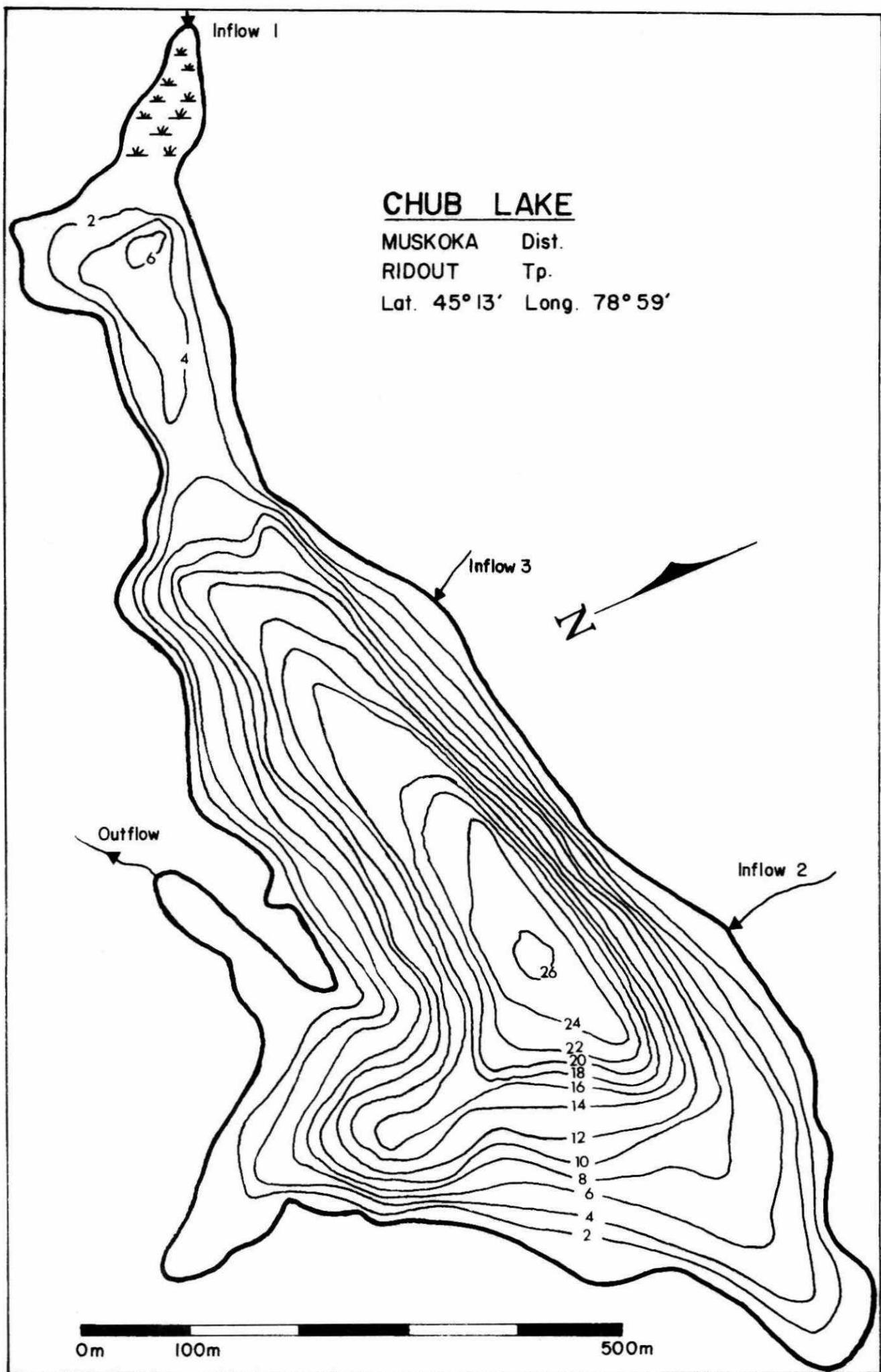
Table 2:   CHUB LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Z_m (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
32.2	28.5	8.9	27	3.87	1.92	0.99

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	32.2	5.77
2	25.6	4.73
4	21.7	3.91
6	17.5	3.17
8	14.3	2.64
10	12.1	2.23
12	10.2	1.78
14	7.72	1.37
16	5.98	1.06
18	4.61	0.782
20	3.25	0.558
22	2.36	0.355
24	1.25	0.115
26	0.109	0.004
27	0	

DICKIE LAKE
MUSKOKA Dist.
McLEAN Tp.
Lat. 45°09′ Long. 79° 05′

Om   100m   500m

Inflow 10
Inflow 9
Inflow 11
Inflow 8
Inflow 7 7a
Inflow 6
Inflow 5
Inflow 4
Inflow 1
Inflow 2
Outflow
Inflow 3
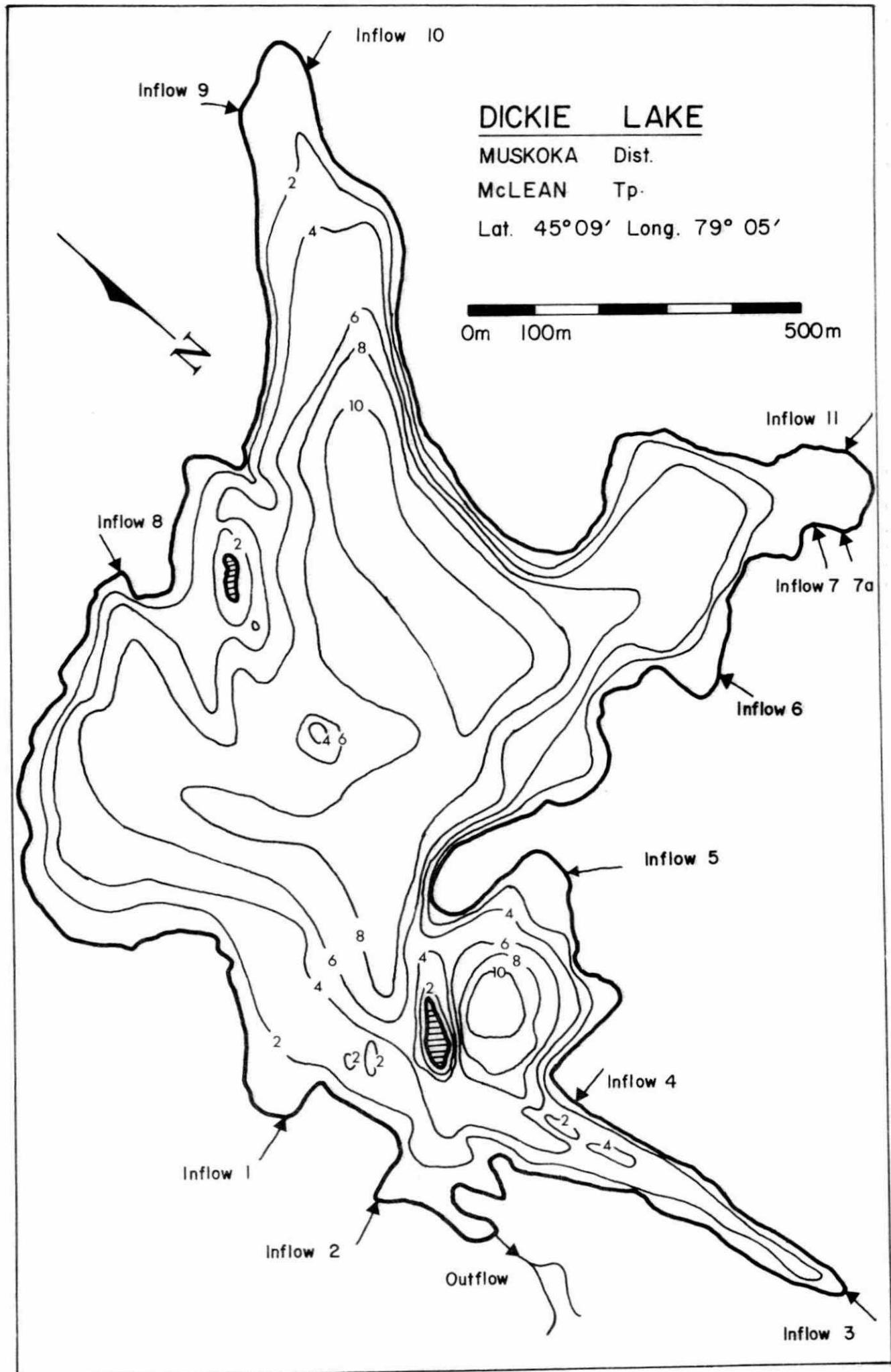
Table 3:   DICKIE LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
93.2	46.4	5.0	12	7.84	2.29	1.25

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	93.2	
		16.7
2	74.5	
		6.99
3	65.4	
		6.10
4	56.7	
		4.84
5	40.6	
		3.73
6	34.1	
		3.04
7	26.9	
		2.27
8	18.7	
		1.55
9	12.5	
		0.883
10	5.58	
		0.280
11	0.752	
		0.025
12	0	

Inflow 5

Inflow 7

Inflow 6a

Inflow 6

Outflow

2

4

8

12

16

°32
28

24

20

24

28

40
0   36   32

Inflow 1

N

20
16

2

4   8   12

2
4

8

12
16

8

2

4

8

12

Inflow 2

4

2

Inflow 4

4

Inflow 3

Inflow 3a

HARP LAKE

MUSKOKA   Dist.

CHAFFEY   Tp.

Lat. 45° 23′ Long. 79° 08′

0m ˙ 100 m   500 m
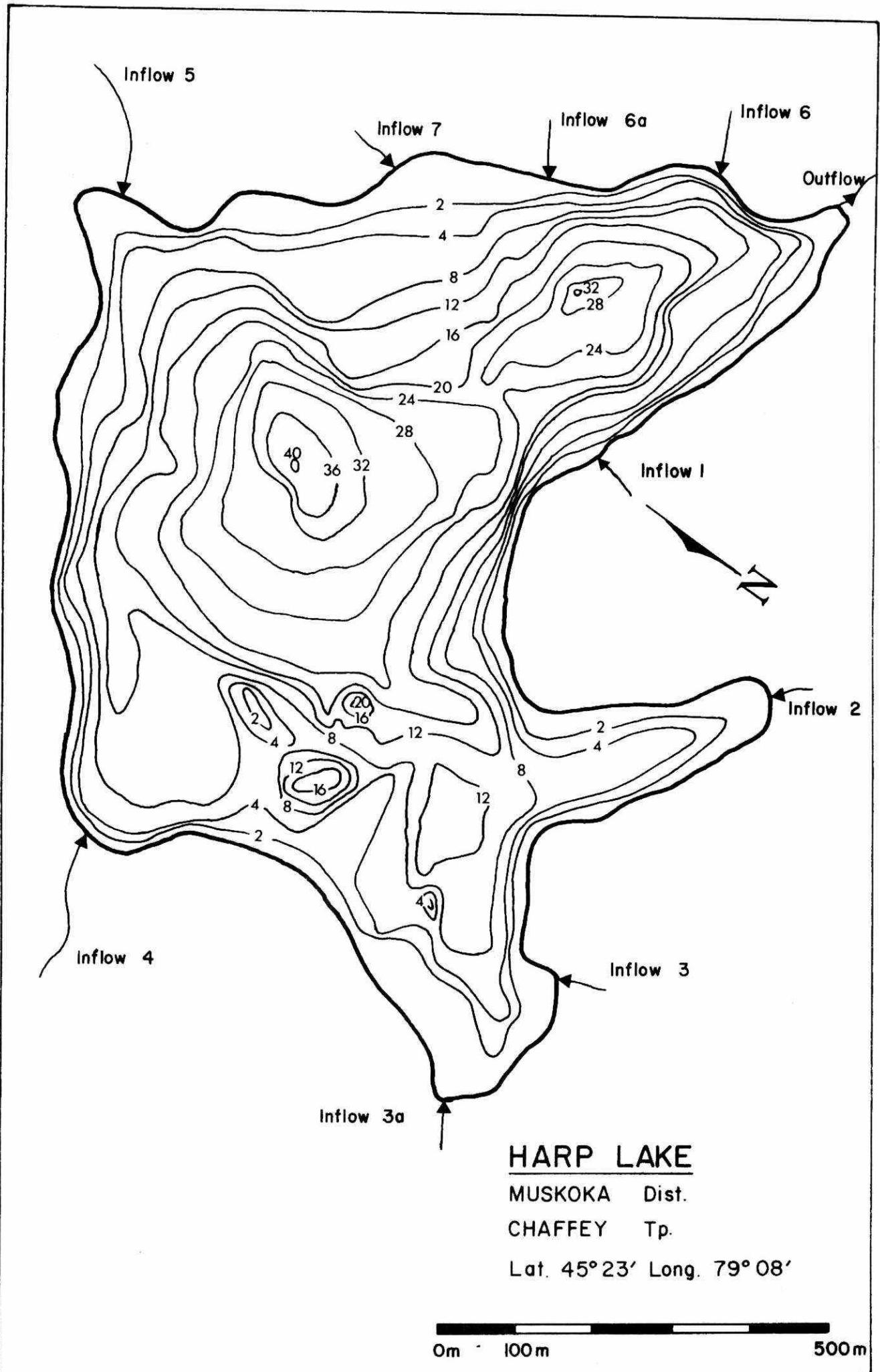
Table 4:   HARP LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
66.9	82.6	12.4	40	4.56	1.57	0.93

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	66.9	
		12.3
2	56.5	
		10.7
4	50.3	
		9.4
6	43.7	
		8.32
8	39.5	
		7.37
10	34.2	
		6.35
12	29.4	
		5.46
14	25.3	
		4.73
16	22.0	
		4.10
18	19.1	
		3.51
20	16.1	
		2.90
22	13.0	
		2.33
24	10.3	
		1.79
26	7.7	
		1.28
28	5.17	
		0.895
30	3.81	
		0.559
32	1.89	
		0.313
34	1.27	
		0.194
36	0.703	
		0.092
38	0.250	
		0.017
40	0	

JERRY LAKE

MUSKOKA   Dist.
SINCLAIR   Tp.
Lat. 45°23′ Long. 79° 06′

Inflow 3

Inflow 2

Inflow 4

N

Inflow 1

Inflow 5

Outflow

2
4
8
12
16
20

8

2
4
8
12
16
24
20
28
32
34

0m   100m   500m
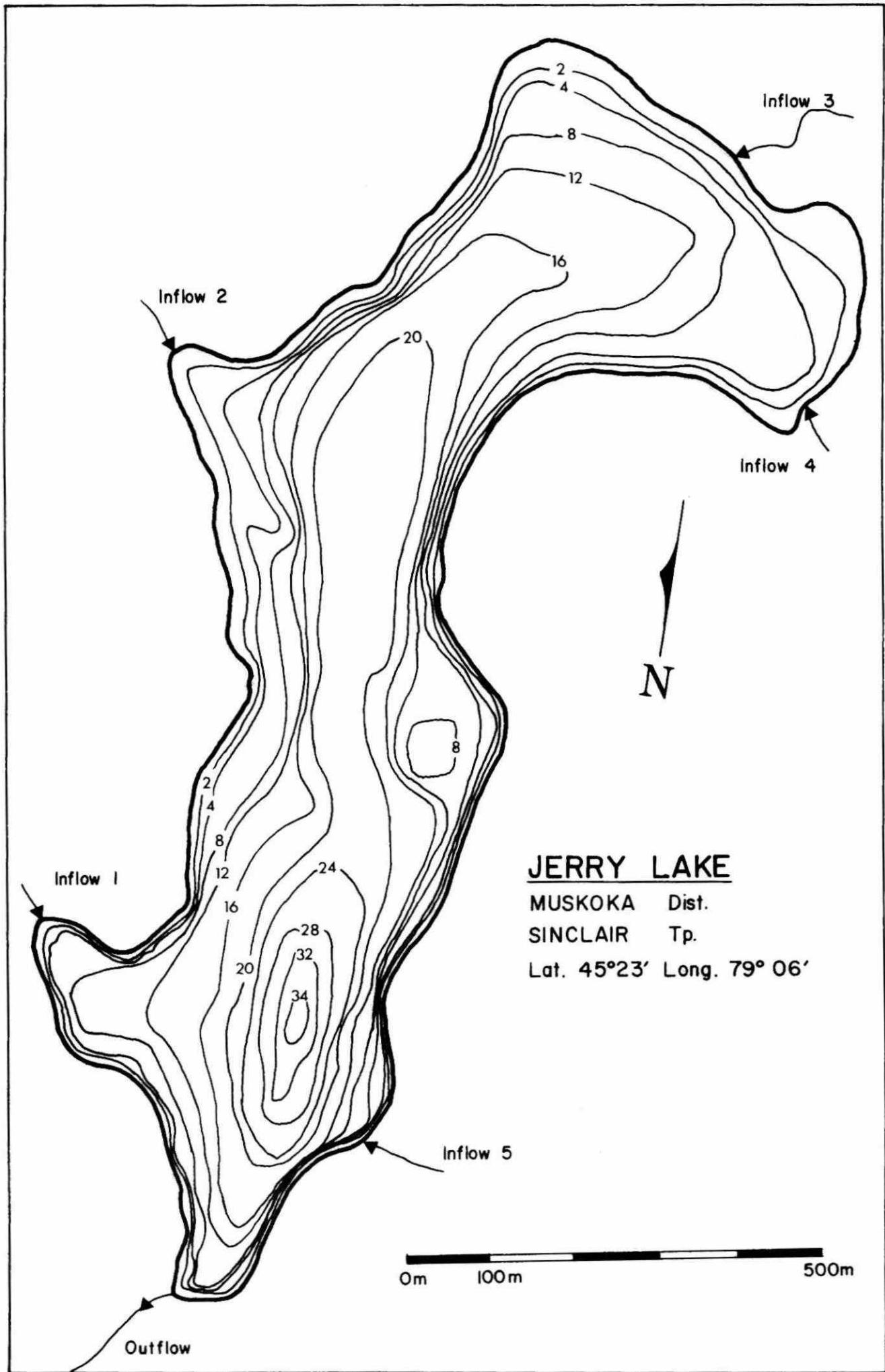
Table 5:   JERRY LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
50.1	61.9	12.4	35	4.60	1.83	1.06

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	50.1	
		9.51
2	45.0	
		8.54
4	40.5	
		14.5
8	32.3	
		11.4
12	24.8	
		8.39
16	17.3	
		3.13
18	14.0	
		2.41
20	10.2	
		2.57
24	3.28	
		0.955
28	1.59	
		0.433
32	0.64	
		0.070
34	0.125	
		0.004
35	0	

BLUE
CHALK
LAKE

Inflow 1

Inflow 2

Inflow
7

RED CHALK LK.

MUSKOKA   Dist.

RIDOUT   Tp.

Lat. 45° 11′ Long. 78° 56′

2 4 8   12   16

N

Inflow 6

28
32   36

Outflow

32
28

Inflow 5

20

24

20 24

24

20

28

16

12

8

2 4

Inflow
4

Inflow 3

0m   100m   500m
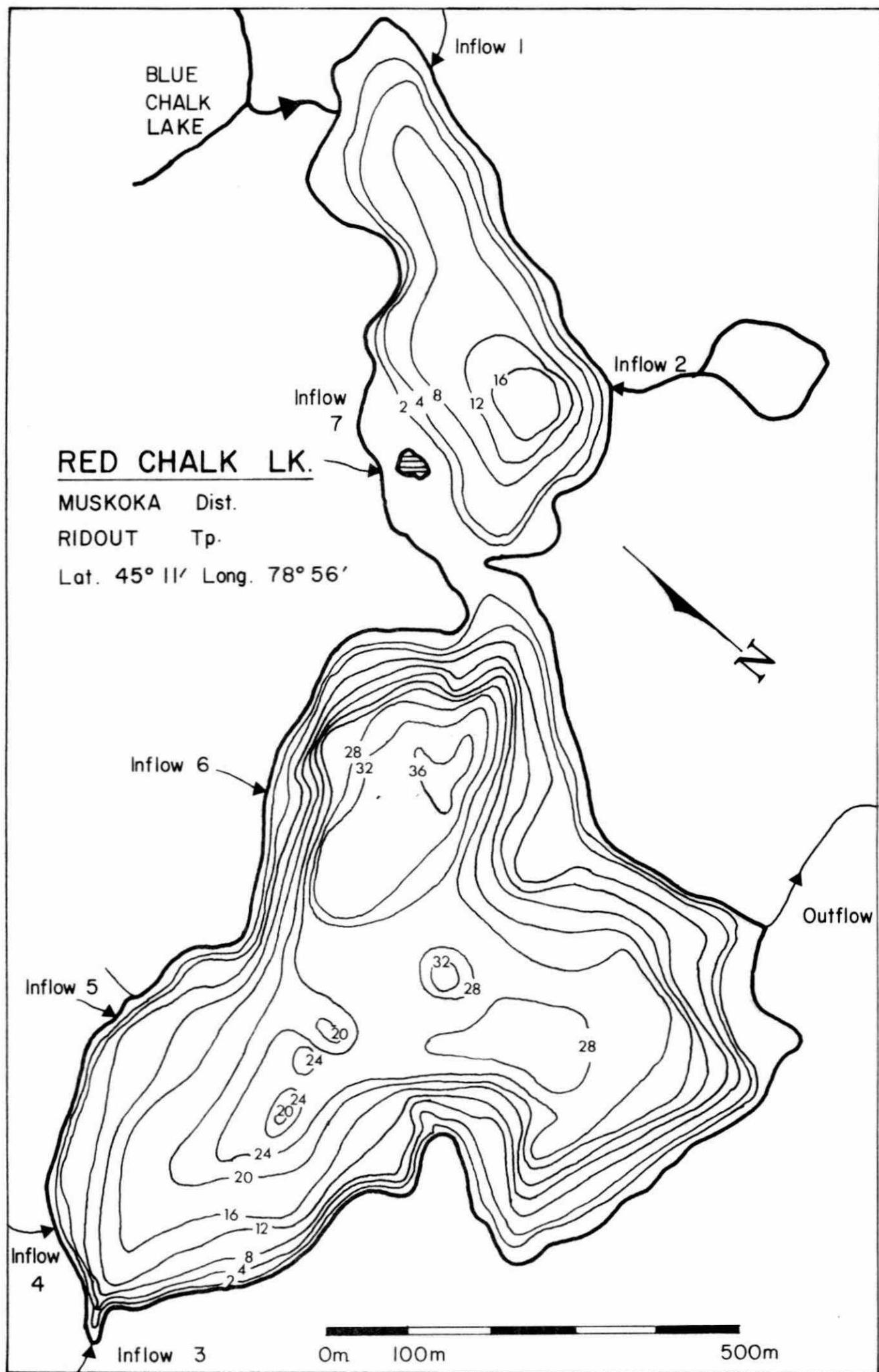
Table 6:   Red Chalk Lake Morphometry Summary

	Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
Whole Lake	56.9	80.8	14.2	38	4.82	1.80	1.12
Main Basin	43.9	73.3	16.7	38	3.15	1.34	1.32
East Basin	13.0	7.46	5.7	19	1.67	1.31	0.90

Whole Lake			Main Basin			East Basin		
Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)	Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)	Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	56.9		0	43.9		0	13.0	
		10.6			8.38			2.17
2	48.7		2	39.8		2	8.85	
		9.34			7.73			1.61
4	44.8		4	37.5		4	7.25	
		16.2			14.0			1.28
8	36.7		8	32.6		6	5.58	
		13.1			12.1			0.965
12	29.0		12	27.7		8	4.11	
		10.5			10.2			0.653
16	24.0		16	23.5		10	2.49	
		8.44			8.36			0.372
20	18.4		20	18.4		12	1.29	
		6.43			6.43			0.202
24	13.8		24	13.8		14	0.756	
		3.80			3.80			0.125
28	5.75		28	5.75		16	0.504	
		1.72			1.72			0.074
32	3.01		32	3.01		18	0.252	
		0.573			0.573			0.008
36	0.315		36	0.315		19	0	
		0.021			0.021			
38	0		38	0				

BASSHAUNT LAKE

HALIBURTON   Co.

GUILFORD   Tp.

Lat. 45°07′ Long. 78°28′

Outflow

Inflow 4

Inflow 3

Inflow 1

Inflow 2

N

0m. 100 m.   1000 m.
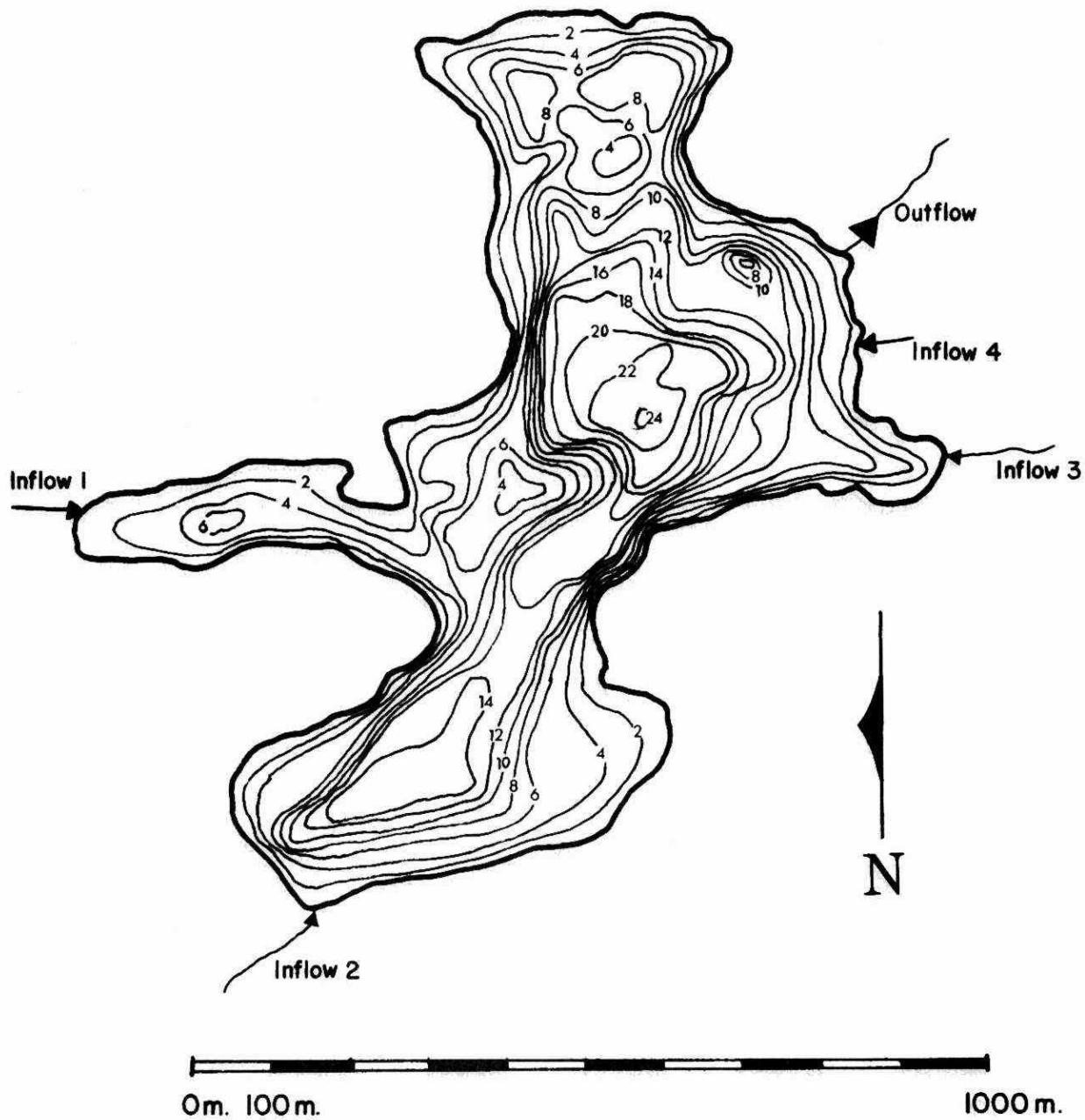
Table 7:   Basshaunt Lake Morphometry Summary

Lake Area A (ha)	Lake Volume V $(m^3 x 10^5)$	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (m)	Development of Shoreline D_L	Development of Volume D_V
47.3	36.6	7.7	24	4.85	1.99	0.96

Contour Depth (m)	Contour Area (ha)	Stratum Volume $(m^3 x 10^5)$
0	47.3	
		8.64
2	39.2	
		7.11
4	32.0	
		5.57
6	23.9	
		4.25
8	18.7	
		3.35
10	14.9	
		2.63
12	11.5	
		1.95
14	8.07	
		1.26
16	4.66	
		0.824
18	3.60	
		0.594
20	2.38	
		0.328
22	1.00	
		0.091
24	0	

BIGWIND LAKE

MUSKOKA   Dist.

OAKLEY   Tp.

Lat. 45° 03′ Long. 79° 03′

| 0m. | 500m. | 1000m. |

N

12
24 8

4

8 8

8

8 12 16 20 28 30
24

4

Outflow
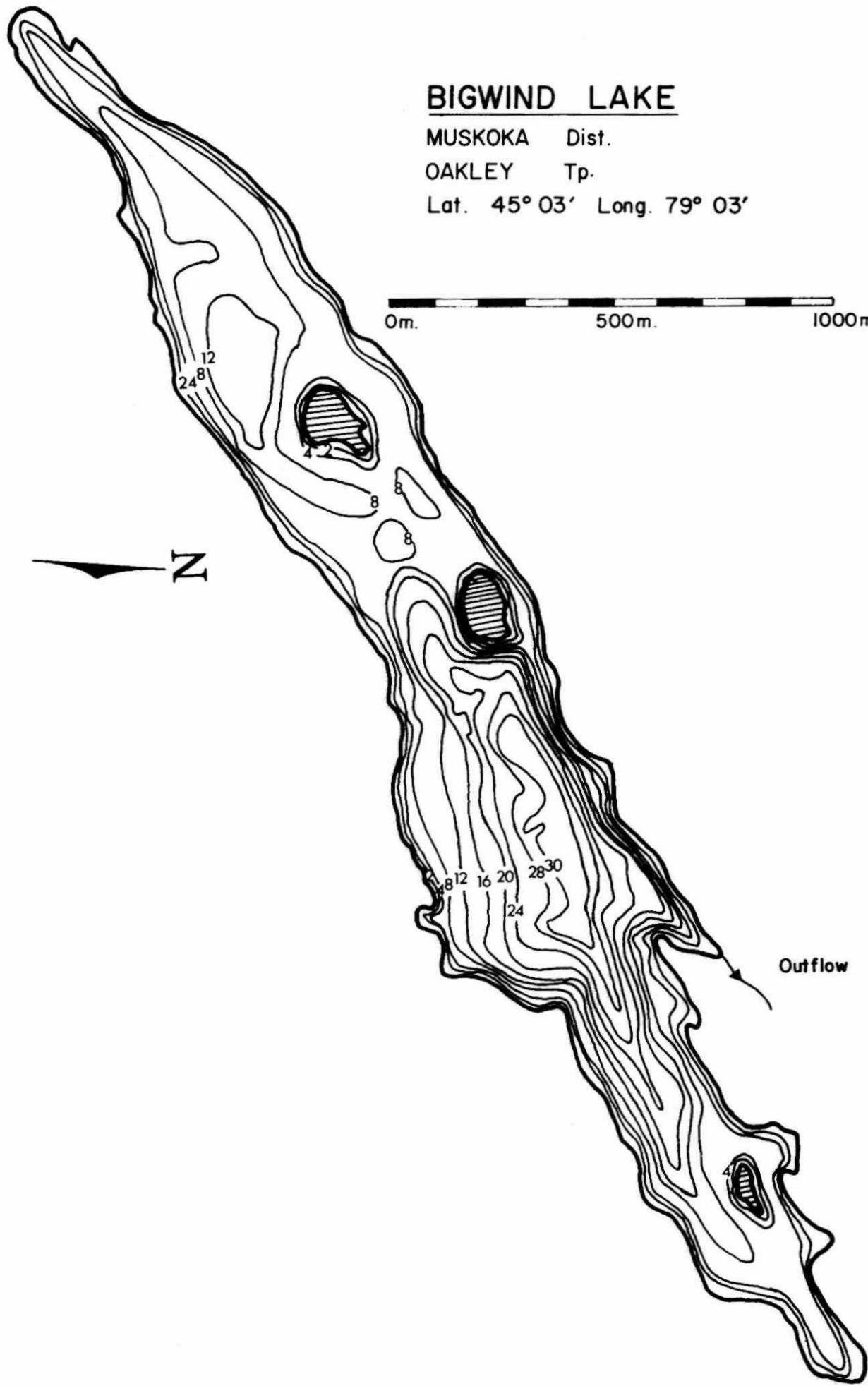
Table 8:   BIGWIND LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V $(m^3 \times 10^5)$	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
111	118	10.7	32	8.24	2.21	1.00

Contour Depth (m)	Contour Area (ha)	Stratum Volume $(m^3 \times 10^5)$
0	111	
		20.8
2	97.2	
		18.4
4	87.0	
		28.4
8	56.0	
		18.3
12	36.3	
		12.3
16	25.6	
		8.70
20	18.2	
		6.09
24	12.5	
		3.82
28	6.90	
		1.03
30	3.61	
		0.241
32	0	

BUCK LAKE

MUSKOKA Dist.
SINCLAIR Tp
Lat. 45° 23' Long 79°00'

Inflow 1

Inflow 2

N

20

4

28

24

20

Outflow

2

8

16

12 8

16

Inflow 5

4

Inflow 4

Inflow 3

0m. 100 m.   1000m.

21
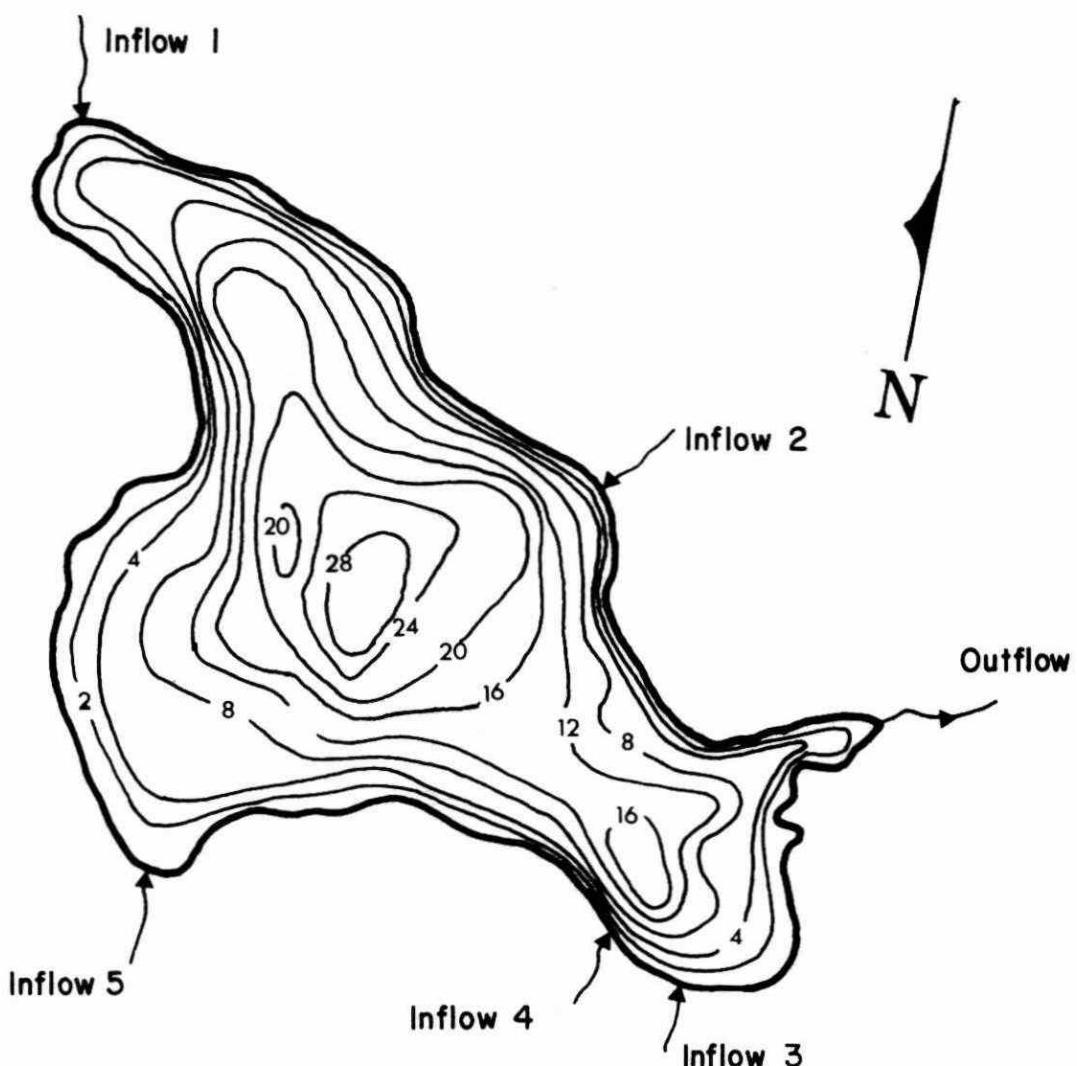
Table 9:   BUCK LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V (m³x10⁵)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
40.3	43.9	10.9	30	3.56	1.58	1.09

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m³x10⁵)
0	40.3	
		7.52
2	34.9	
		6.58
4	31.0	
		5.77
6	26.8	
		4.95
8	22.8	
		4.22
10	19.5	
		3.63
12	16.8	
		3.13
14	14.5	
		2.55
16	11.1	
		1.90
18	7.95	
		1.39
20	6.03	
		0.974
22	3.79	
		0.596
24	2.24	
		0.377
26	1.55	
		0.238
28	0.864	
		0.083
30	0	

CROSSON   LAKE

MUSKOKA   Dist.

OAKLEY   Tp.

Long.   45° 05′   Lat. 79° 02′

Outflow

N

2

4

8

12

Inflow 1

16

24

20

12

14

12

12

8

2

8

Inflow 2
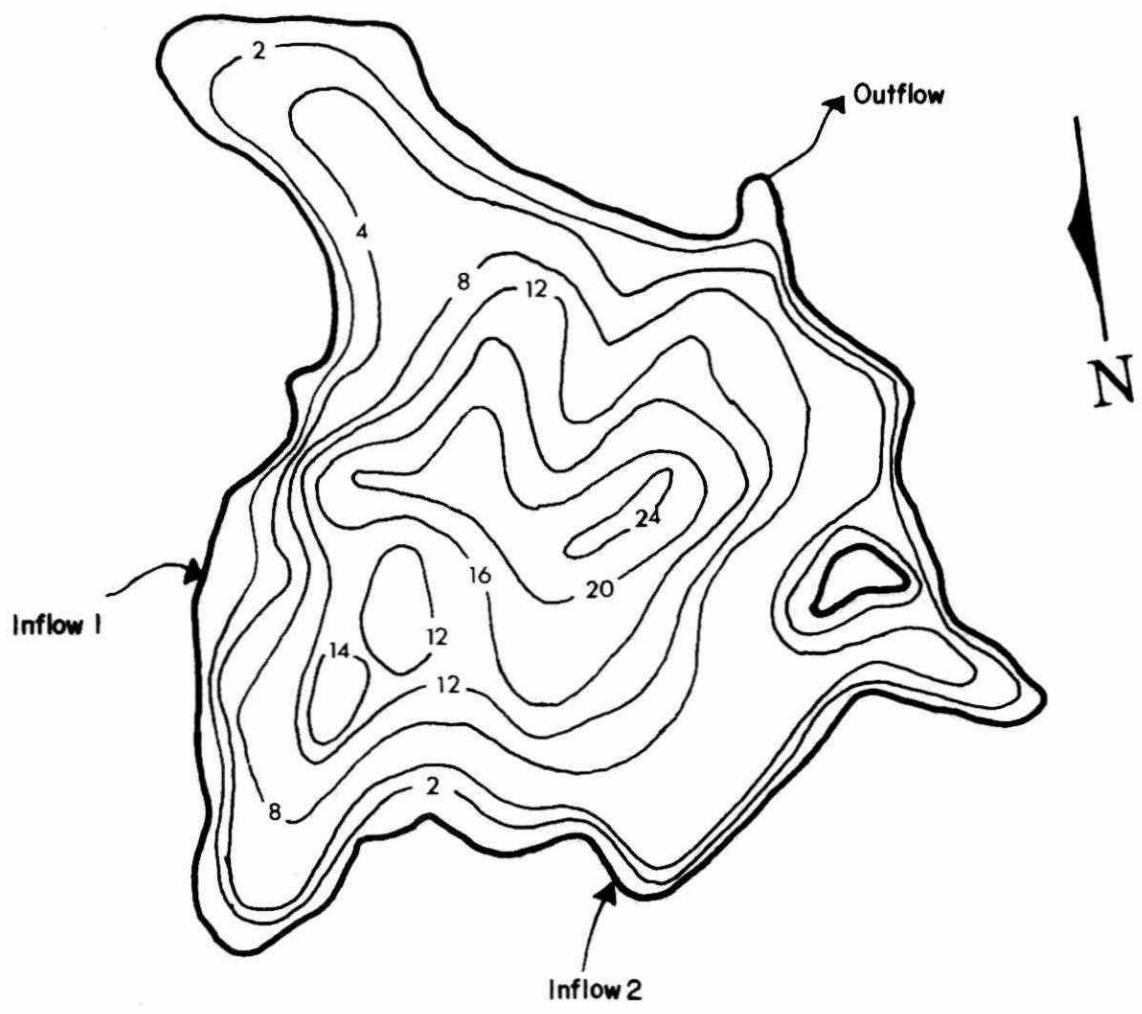
Om. 100m.   1000 m.

Table 10:   CROSSON LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
56.8	47.7	8.4	25	3.88	1.45	1.01

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	56.8	
		10.4
2	47.5	
		8.67
4	39.3	
		7.07
6	31.5	
		5.60
8	24.6	
		4.52
10	20.6	
		3.66
12	16.1	
		2.79
14	11.9	
		2.05
16	8.70	
		1.44
18	5.84	
		0.90
20	3.28	
		0.419
22	1.10	
		0.132
24	0.304	
		0.010
25	0	

GLEN LAKE

HALIBURTON Co.

GUILFORD Tp.

Lat. 45°08′ Long. 78°30′

Outflow

Inflow 1

Inflow 2

2
4
6
8
10
12
14

N
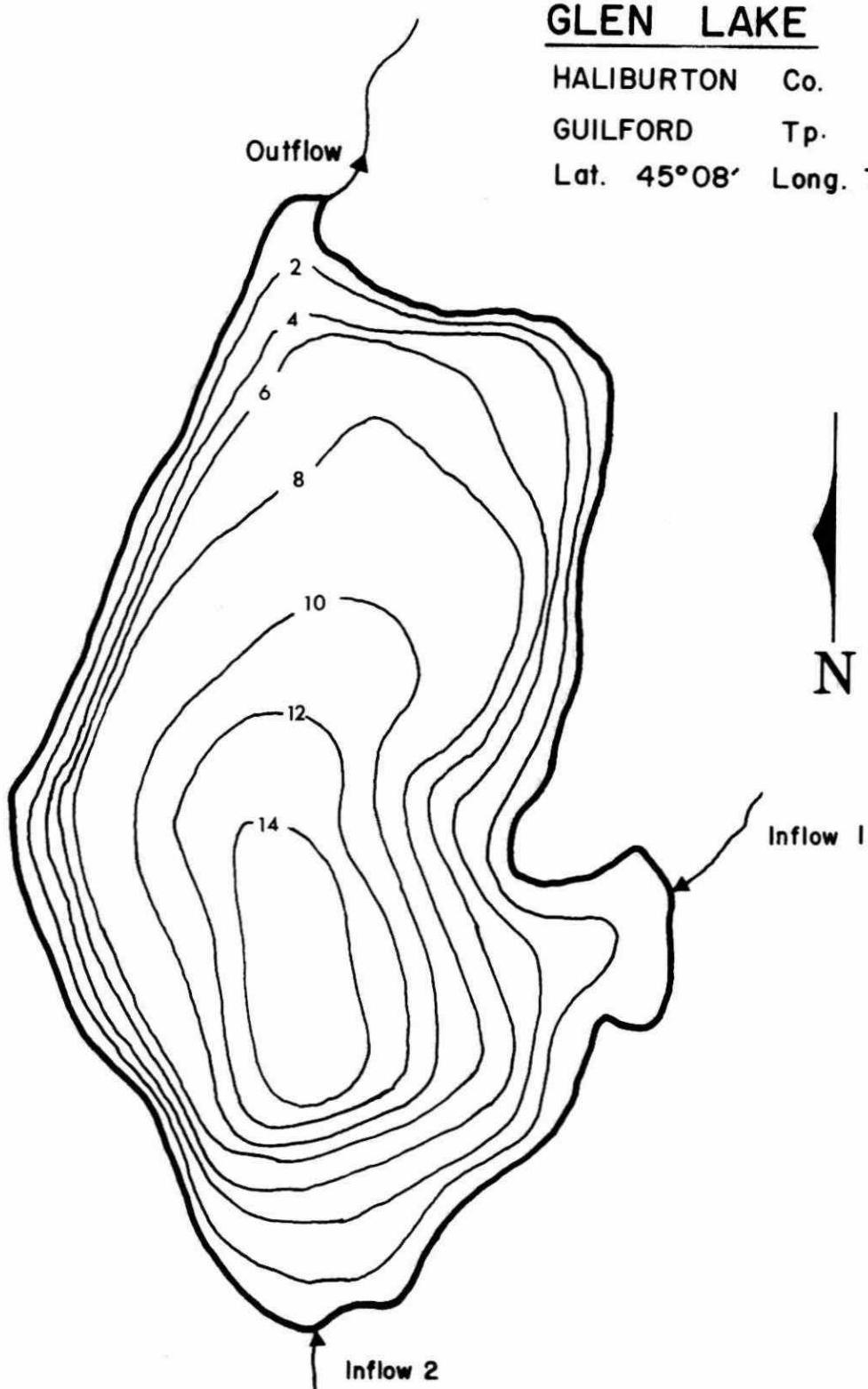
0 m.   100 m.   500 m.

Table 11:   GLEN LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
16.3	11.8	7.2	15	1.83	1.28	1.44

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	16.3	
		3.02
2	13.9	
		2.59
4	12.0	
		2.21
6	10.1	
		1.79
8	7.81	
		1.17
10	4.13	
		0.638
12	2.34	
		0.321
14	0.976	
		0.032
15	0	

GULLFEATHER   LAKE

MUSKOKA   Dist.

OAKLEY   Tp.

Lat.   45°06′ Long. 79°01′

Inflow 2

Inflow 1

4

4

6

2

4

8

10

12

2

4

N

4

2

Outflow
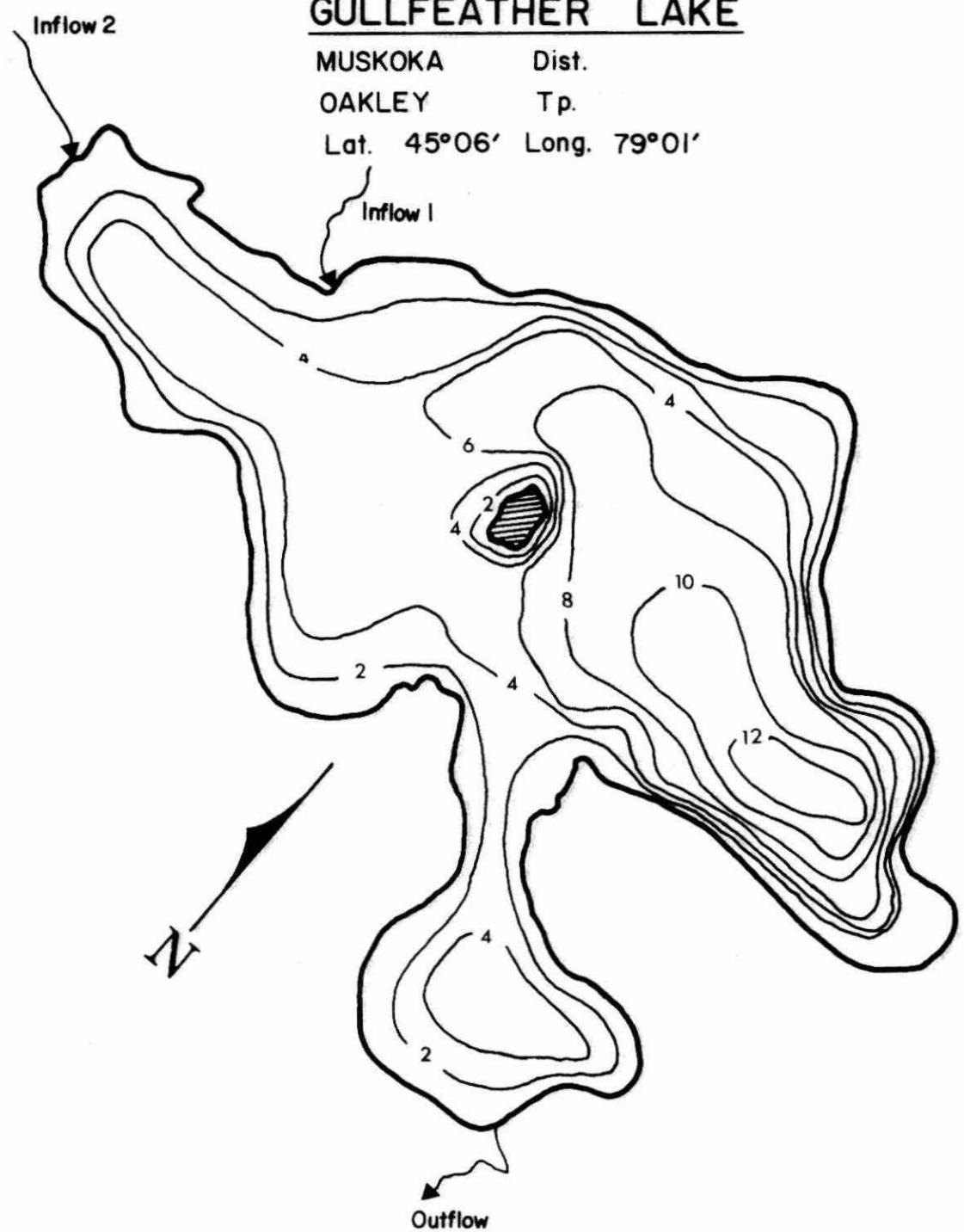
0m. 100m.   1000m.

Table 12:   GULLFEATHER LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V $(m^3 x 10^5)$	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
65.9	31.5	4.8	13	5.26	1.83	1.11

Contour Depth (m)	Contour Area (ha)	Stratum Volume $(m^3 x 10^5)$
0	65.9	
		11.6
2	50.8	
		8.75
4	37.1	
		5.63
6	20.1	
		3.25
8	12.6	
		1.66
10	4.66	
		0.533
12	1.09	
		0.036
13	0	

LITTLE CLEAR LAKE
MUSKOKA Dist.
SINCLAIR Tp.
Lat. 45° 24' Long. 79° 00'

0 m.   100 m.   500 m.

TURTLE
LAKE

< 2m.

Outflow

Inflow 3

Inflow 2

N

2
4
8
12
16
20
24

Solitaire
Outflow

Inflow I
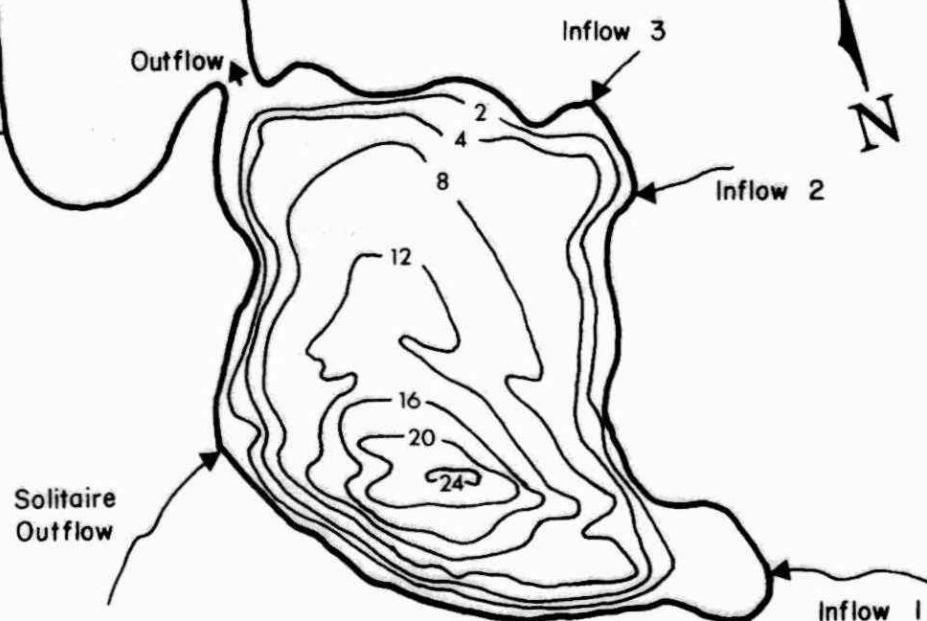
Table 13: **LITTLE CLEAR LAKE MORPHOMETRY SUMMARY**

Lake Area A (ha)	Lake Volume V $(m^3 \times 10^5)$	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
10.9	8.86	8.1	25	1.48	1.26	0.97

Contour Depth (m)	Contour Area (ha)	Stratum Volume $(m^3 \times 10^5)$
0	10.9	
		1.99
2	8.99	
		1.69
4	7.97	
		1.45
6	6.51	
		1.19
8	5.39	
		0.905
10	3.71	
		0.613
12	2.46	
		0.395
14	1.52	
		0.254
16	1.04	
		0.175
18	0.72	
		0.116
20	0.448	
		0.064
22	0.208	
		0.020
24	0.024	
		0.001
25	0	

SOLITAIRE LAKE
MUSKOKA Dist.
SINCLAIR Tp.
Lat. 45° 22' Long. 79° 00'

Outflow

Inflow 1

Inflow 2

Inflow 3

Inflow 4

N

0m.   100m.   500m.
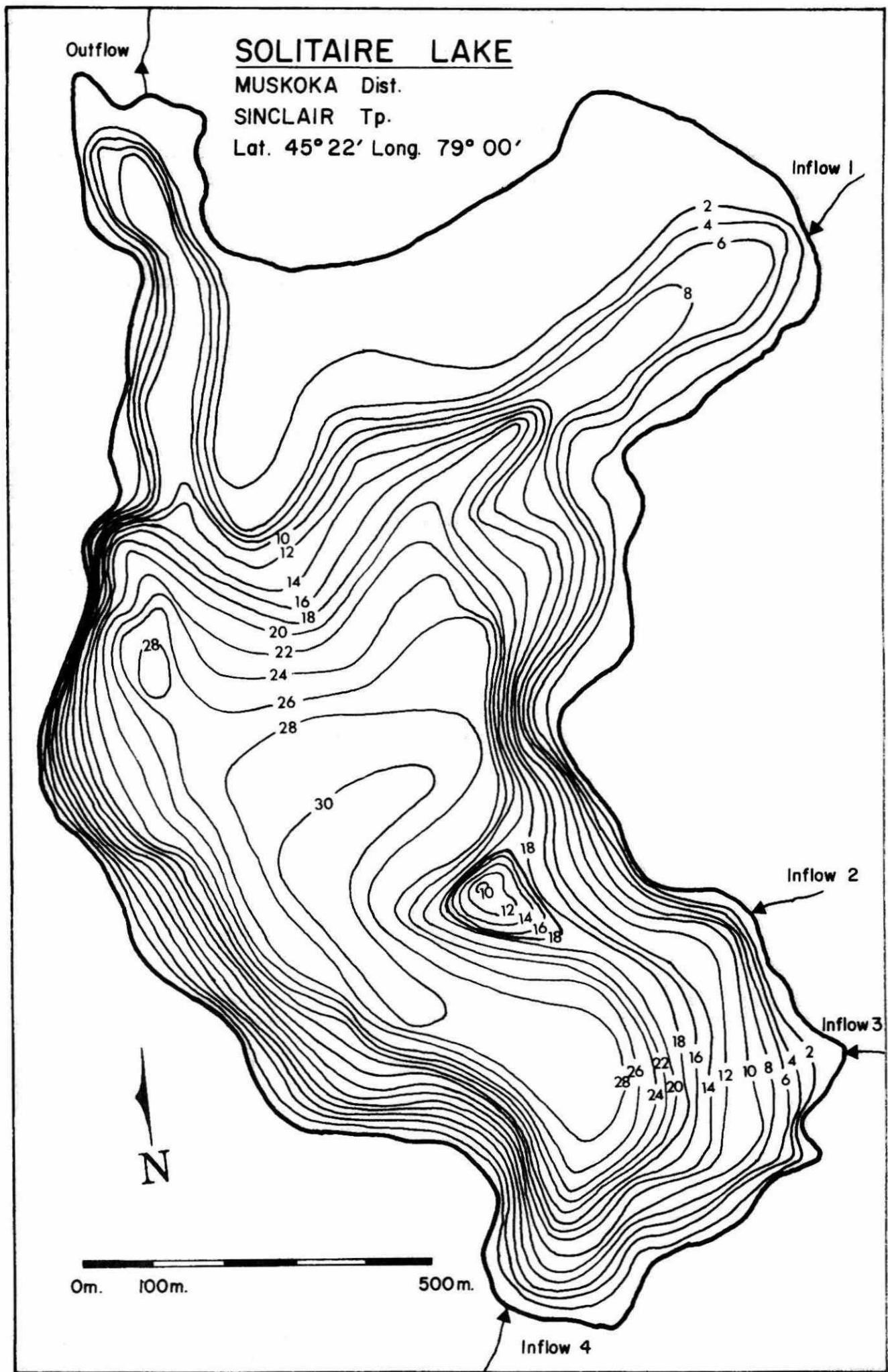
Table 14:   SOLITAIRE LAKE MORPHOMETRY SUMMARY

Lake Area A (ha)	Lake Volume V $(m^3 \times 10^5)$	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
124	164	13.3	31	5.98	1.51	1.29

Contour Depth (m)	Contour Area (ha)	Stratum Volume $(m^3 \times 10^5)$
0	124	
		22.2
2	98.6	
		18.7
4	88.9	
		17.1
6	82.3	
		15.7
8	74.9	
		14.2
10	66.8	
		12.7
12	60.6	
		11.5
14	54.5	
		10.4
16	49.0	
		9.27
18	43.7	
		8.22
20	38.6	
		7.23
22	33.8	
		6.24
24	28.7	
		5.12
26	22.6	
		3.53
28	13.1	
		1.56
30	3.52	
		0.117
31	0	

WALKER LAKE

MUSKOKA   Dist.

SINCLAIR   Tp.

Lat. 45° 24' Long. 79° 05'

Inflow 2

Inflow 4

Inflow 1

4

2

6

4

4

6

2

4

6

8

16

4

10

12

14

12
10
8
6

4

4
2

2

4

8

6

4

10

4

2

Inflow 3

N

4

2

2

Outflow

Om   100m   500m
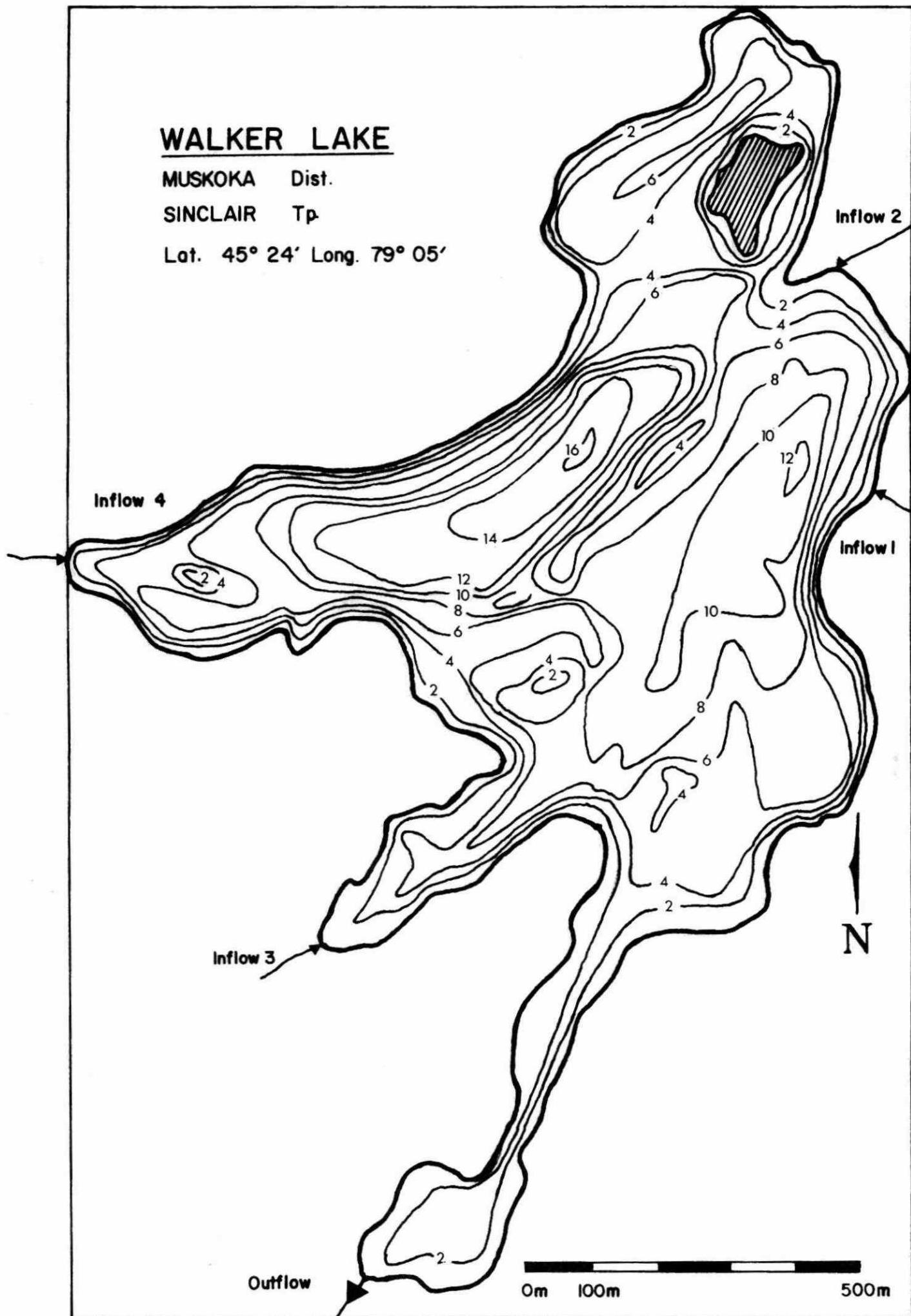
Table 15:   **WALKER LAKE MORPHOMETRY SUMMARY**

Lake Area A (ha)	Lake Volume V ($m^3 \times 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
68.2	42.1	6.2	17	6.44	2.20	1.09

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 \times 10^5$)
0	68.2	
		12.6
2	58.2	
		10.5
4	46.8	
		8.07
6	34.3	
		5.32
8	19.6	
		3.04
10	11.2	
		1.65
12	5.63	
		0.715
14	1.86	
		0.155
16	0.08	
		0.003
17	0	